**Supplementary information S1: Encapsulation efficiency methodological details**

**Table S1A**. Ribosomal RNA standard.

|  |  |  |  |
| --- | --- | --- | --- |
| Final mRNA (µg/mL) | Ribosomal RNA standard | TE buffer 1X | Solution |
| 0.2 | 2 µL stock | 998 µL | A |
| 0.15 | 187.5 µL solutionA | 62.5 µL | B |
| 0.1 | 250 µL solutionA | 250 µL | C |
| 0.05 | 250 µL solutionC | 250 µL | D |
| 0.025 | 250 µL solutionD | 250 µL | E |

**Table** S1B. RNA:pBAE with heparin standard

|  |  |  |  |
| --- | --- | --- | --- |
| Final mRNA (µg/mL) | RNA:PBAE stock (6 µg/mL) | Heparin (100 µg/µL) | TE buffer 1X |
| 0.2 | 8 µL | 45 µL | 197 µL |
| 0.15 | 6 µL | 33.75 µL | 210.25 µL |
| 0.1 | 4 µL | 22.5 µL | 223.5 µL |
| 0.05 | 20.75 µL \* | 11.25 µL | 218 µL |
| 0.025 | 10.5 µL\* | 5.62 µL | 233.8 µL |

**Table S1C**. Heparin standard

|  |  |  |
| --- | --- | --- |
| Final heparin (µg/µL) | Heparin (100 µg/µL) | TE buffer 1X |
| 18 | 45 µL | 205 µL |
| 13.5 | 33.75 µL | 216.25 µL |
| 9 | 22.5 µL | 227.5 µL |
| 4.5 | 11.25 µL | 238.75 µL |
| 2.25 | 5.62 µL | 244.38 µL |

**Supplementary information S2: Polymers characterization**

**Figure S2A** shows the NMR proton spectra of the C6-pBAE. Chloroform-d was used as solvent (d=7.25 ppm). Peaks between 5.7 ppm and 7.4 ppm correspond to the olefins’ signals associated to terminal acrylates of C6-pBAE. Once the peptides are added to the C6-pBAE, the resulting OM-pBAE is also characterized using 1H-NMR. **Figure S2B** shows the NMR proton spectra of an example C6-peptide using Cys-His-His-His. D2O was used as solvent (d =4.64 ppm). The disappearance of the olefins’ signals associated to terminal acrylates (between 5 and 7 ppm) indicate the reaction of the CH3 oligopeptides since it is done by the acrylates of the polymer. Furthermore, the presence of peaks between 7 and 8.5 ppm indicates the presence of the histidine oligopeptide (-N(=CH)-NH-C(=CH)-).

C6-pBAE

1H-NMR (400 MHz, CD3OD, TMS) (ppm): δ = 6.40 (d, CH2=CH-), 6.10 (d, CH2=CH-), 5.83 (d, CH2=CH-), 4.18 (br, CH2-O-C(=O)-CH-CH2), 4.09 (t, -CH2-CH2-O-), 3.62 (t, CH2-CH2-OH), 2.78 (br, -CH2-CH2-N-), 2.45 (br, -N-CH2-CH2-C(=O)-O), 1.83–1.60 (br, -O-CH2-CH2-CH2-CH2-O), 1.40-1.18 (br, -CH2-CH2-CH2-CH2-OH, N-(CH2)2-CH2-(CH2)2-OH), 0.88 (t, CH2-CH2-CH3).

CH3-C6

1H-NMR (400 MHz, D2O, TMS) (ppm): δ = 8.0-7.0 (br -N(=CH)-NH-C(=CH)-) 4.61-4.36 (br, -CH2-CH-), 4.16 (t, CH2-CH2-O-), 3.55 (t, CH2-CH2-OH), 3.18 (t, CH2-CH2-N-), 3.06 (dd, -CH2- CH-), 2.88 (br, OH-(CH2)4-CH2-N-), 2.82 (dd, -CH2-S-CH2-), 2.72 (br, -N-CH2-CH2-C(=O)-O), 1.75 (br, -O-CH2-CH2-CH2-CH2-O), 1.65 (m, NH2-CH2-CH2-(CH2)2 -CH-), 1.58 (br, -CH2-CH2-CH2-CH2-OH), 1.40 (br, -N-(CH2)2-CH2-(CH2)2-OH), 0.88 (t, CH2-CH2-CH3).

**A**

**B**

**Figure S2 1H-NMR proton spectra of C6-pBAE and OM-pBAE.** **A.** 1H-NMR from the C6-pBAE. **B.** 1H-NMR from the C6CH3.